A Method for Detecting the Alignment of Document in an Automatic Document Feeder

1. Field of the Invention:

[0001] The present invention relates to an inspection method for a document, especially to a kind of inspection method for the document automatically fed from an automatic document feeder carried by an optical scanner.

2. Background of the Invention:

[0002] The times and the technologies are changed day by day. The relative technologies of electronic devices are progressed daily. The functions of electronic product are also enhanced abruptly. Relatively, the computer peripheries are expanded more and more quickly to provide the required convenience in daily life. The scanner is a commonly seen computer periphery. The main function of the scanner is to retrieve an image of scanned document and convert the retrieved image into electronic signals. And, the electronic signals are input to a computer to proceed image treatment.

[0003] Please refer to Fig. 1, which is an embodiment for a typical optical scanner 1 commonly seen in current market. A document window glass 15 for supporting a document 30 to be scanned is arranged on the upper side surface of a shell body 11 of the optical scanner 1. A scanning module 14 driven by a driving device 12 proceeds a linear motion along the direction of a guiding rod 13 inside the shell body 11 to execute an image scanning job to the document 30 placed on the document window glass 15.

[0004] Please refer to Fig. 2A to Fig. 2C, which are the execution embodiments for the automatic document feeder carried by an optical scanner commonly seen in current market. Wherein the automatic document feeder 2 is arranged on the upper side of the prior optical scanner 1 to provide scanning job for the automatically fed document 30. When proceeding the automatically document-feeding scanning, the scanning

module 14 moves along the guiding rod 13 to a lower edge of the optical scanner 1 and is secured thereof. The document 30 is driven into the position of the scanning window 16 by the friction force of the rotation motion of the roller set 21. The motion of automatic document feeding and scanning is then completed.

[0005] When the document 30 is placed by the prior automatic document feeder 2, because the document 30 placed in slant way or the change of friction coefficient on the surface of the roller set 21 due to frequent usage, a slant is generated on the document driven by the non-uniform friction force applied by the roller 21. A slant document 30 will be scanned and an erroneous or mistaken scanned product is completed. Therefore, it must depend personnel to observe for changing or give up the scanning job of the automatic document feeder. So, it wastes lots of human power, time and material means. Above-mentioned problems are really needed to be solved among persons or industries to reduce the cost paid by the person or society and promote the industrial competition abilities of the country. Therefore, the break-through and solution for this problem is really urgent.

[0006] To break-through and solute above problem, several relative makers proposed that a plurality of black-line-pattern be arranged on the automatic document-feeder. Please refer to Fig. 3A to Fig. 3F, which show that the automatic document feeder 2 has plural black-line-patterns 23 of left-and-right symmetry in corresponding to the scanning window 16 of the optical scanner 1. The automatic document feeder 2 feeds the document 30 in. After reading the image variation of the black line patterns 23, the time is counted by a timer (not shown in the drawing) that is set with a preset value, through an appropriate time, the document 30 is detected. When the document 30 is fed in a slant way, only one side of the black line patterns is blocked by the document 30, so the motion will be stopped and an alarm is set off. When the document 30 is fed in normal way, two sides of the patterns will all be blocked by the document 30, a second detection will be executed for securing no error happened and then a scanning is executed.

[0007] But to solve above problem, not only complicated detection steps are required, but also an increase of accessories for scanner is needed. It is also impossible to accurately detect the slant quantity of the document.

Since a single arrangement is only for a single machine, so for various scanners, a wide availability can not be obtained. Therefore, the prior solution can not appropriately and completely fulfill the requirement for the manufacturing industries. The problem still can not get suitable solution that is urgent required by the manufacturing industries to promote the technology of competition abilities.

SUMMARY OF THE INVENTION

[0008] The main object of the present invention is to provide an inspection method for optical scanner with automatic document feeding. The method may detect and calculate the slant quantity of a document fed by the automatic document feeder for surely reaching the function that the automatic document feeder of optical scanner won't generate slant scanning.

[0009] To fulfill above-mentioned objects, a method for detecting the alignment of document in an automatic document feeder, comprising the steps of:

[0010] Step A: providing an optical scanner having an automatic document feeder and a document. The automatic document feeder has a colored pattern layer in corresponding to a scanning window of the optical scanner. The document has at least one side edge. When the document is fed into the automatic document feeder, the side edge is just located between the scanning window and the colored pattern layer.

[0011] Step B: actuating the automatic document feeder to feed in the document, a first image retrieval is made for the document placed on the scanning window.

[0012] Step C: an appropriate length of the document is fed in.

[0013] Step D: a second image retrieval is made for the document placed on the scanning window.

[0014] Step E: a slant value is calculated out from the result of comparing the first image retrieval and the second image retrieval.

[0015] Wherein for a preference of the present invention, after the step

E, comprising the steps of:

[0016] Step F: comparing the slant value with a preset value.

[0017] Step G: if the slant value is smaller than the preset value, then scanning the document is begun.

[0018] Step H: if the slant value is larger than the preset value, then the motion is stopped.

[0019] For your esteemed committee to further understand and recognize the present invention, a detailed description in matching with corresponding drawings are presented as following.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Fig. 1 is an execution illustration for prior optical scanner.

[0021] Fig. 2A is an execution illustration for a three-dimensional structure of an automatic document feeder carried in prior optical scanner.

[0022] Fig. 2B is an execution illustration for an "A-A" cross-sectional structure of an automatic document feeder carried in prior optical scanner.

[0023] Fig. 2C is an upper view for an automatic document feeder carried in prior optical scanner.

[0024] Fig. 3A is a cross-sectional structure illustration for the embodiment of plural black-line-patterns provided in the prior automatic document feeder.

[0025] Fig. 3B is an upper view illustration before the prior plural black-line-patterns executing slant document feeding.

[0026] Fig. 3C is an upper view illustration after the prior plural black-line-patterns executing slant document feeding.

[0027] Fig. 3D is an upper view illustration before the prior plural black-line-patterns executing normal document feeding.

[0028] Fig. 3E is an upper view illustration for the first execution of

normal document feeding for the prior plural black-line-patterns.

[0029] Fig. 3F is an upper view illustration for the second execution of normal document feeding for the prior plural black-line-patterns.

[0030] Fig. 4A is a cross-sectional structure illustration for a preferable embodiment for a colored-pattern-layer arranged in the automatic document-feeder of the present invention.

[0031] Fig. 4B is an upper view illustration for the first embodiment of a colored-pattern-layer position provided in present invention.

[0032] Fig. 4C is an upper view illustration for the second embodiment of a colored-pattern-layer position provided in present invention.

[0033] Fig. 4D is an upper view illustration for the third embodiment of a colored-pattern-layer position provided in present invention.

[0034] Fig. 4E is an upper view illustration for the fourth embodiment of a colored-pattern-layer position provided in present invention.

[0035] Fig. 4F is an upper view illustration for the fifth embodiment of a colored-pattern-layer position provided in present invention.

[0036] Fig. 5A is an illustration for the first preferable embodiment for the first image retrieval of the present invention detecting the slant of a document.

[0037] Fig. 5B is an illustration for the first preferable embodiment for the second image retrieval of the present invention detecting the slant of a document.

[0038] Fig. 6A is an illustration for the second preferable embodiment for the first image retrieval of the present invention detecting the slant of a document.

[0039] Fig. 6B is an illustration for the second preferable embodiment for the second image retrieval of the present invention detecting the slant of a document.

[0040] Fig. 7A is an illustration for the third preferable embodiment for the first image retrieval of the present invention detecting the slant of a

document.

[0041] Fig. 7B is an illustration for the third preferable embodiment for the second image retrieval of the present invention detecting the slant of a document.

[0042] Fig. 8 is a flow chart illustration for the first preferable embodiment for the method of the present invention to test slant for an optical scanner provided with an automatic document feeder.

[0043] Fig. 9 is a flow chart illustration for the second preferable embodiment for the method of the present invention to test slant for an optical scanner provided with an automatic document feeder.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0044] The main characteristic of the inspection method for optical scanner with automatic document feeding is that a colored pattern layer of color different from that of the operation document is provided in the automatic document feeder in corresponding to the optical scanner for providing the fed document to block the colored pattern layer and reach a function of detecting slant value of the document.

[0045] Please refer to Fig. 4A, which is a cross-sectional structure illustration for a preferable embodiment for a colored-pattern-layer provided in an automatic document feeder of the present invention. Wherein, the prior optical scanner 1 has an automatic document feeder 2 by a manner of carrying to provide automatic scanning operation for the automatically fed document 30. While in a preferable embodiment of the present invention, a colored pattern layer 22 is arranged at the automatic document feeder 2 in corresponding to the scanning window 16 of the optical scanner 1. The color of the colored pattern layer 22 is different from the operation color of the document 30. When the document 30 is fed into the automatic document feeder 2, the document 30 is just positioned between the scanning window 16 and the colored pattern layer 22.

[0046] Please refer to Fig. 4B to Fig. 4F, which show the upper illustrations for preferable embodiments of the present invention provided with colored pattern layer. Wherein, the preferable colored pattern layer 22 in present invention is a rectangular block arranged on a scan line 17 positioned in the scanning window 16. The width of the layer 22 is wider than that of the document 30. The arrangement of the colored pattern layer 22 may be positioned at the right side position of the scan line 17 (as shown in Fig. 4C). The transformation of such technique may be that a colored pattern layer 22 (as shown in Fig. 4D) is arranged at each left position and right position of the scan line 17. It is easily known that the arrangement of the colored pattern layer 22 is a long stripe that covers the entire scan line 17 (as shown in Fig. 4E) to also reach the function of the present invention. Of course, the shapes of the colored pattern layer could be also circular shape (as shown in Fig. 4F) or other shapes. So, the transformation can be easily executed according to the aforementioned description of the present invention, which is still within the technical scope of the present invention, and further detailed description is not repetitiously presented here.

[0047] Please refer to Fig. 5A through Fig. 7B, which show the illustrations of preferable embodiments with first image retrieval and second image retrieval for the document's inspection of the present invention. Wherein, Fig. 5A through Fig. 6B is the detecting method that the arrangement of the colored pattern layer 22 is at left position of the scan line 22. The document 30 has at least a side 31. The side 31 is parallel to the feeding direction 222, of which the document 30 is fed into the automatic document feeder 2.

[0048] Please refer to Fig. 5A and Fig. 5B. When the document 30 is automatically fed in initially, if the document 30 is slanted to the first direction (clock-wise direction) 43, the side 31 will move onto the scan line 17 firstly, and intercross with the scan line 17 to form a first side point 311. At this time, the first image retrieval is a first distance 41 detected between the first side point 311 and a reference point 221positioned at the colored pattern layer 22. Wherein, the reference point 221 is positioned at appropriate fixing point on the scan line 17. In a preferable embodiment of the present invention, the reference point 221 is the fixing point on the most outer or inner side. Of course, the reference point 221 may also be other

fixing point that is provided of easy detection. These sorts of transformation may be executed easily according to the aforementioned description of the present invention, therefore they are not repetitiously described here any more. Afterwards, the document is fed in for an appropriate length 32, wherein the side 31 will intercross with the cross line 17 to form a second side point 312. At this time, the second image retrieval is a second distance 42 detected between the second side point 312 and the reference point 221.

[0049] Please refer to Fig. 6A and Fig. 6B. When the document is moving in slant way to the second direction (i.e., the counter clock-wise direction) 44, the side 31 will move onto the scan line 17 firstly, and intercross with the scan line 17 to form a first side point 311a. At this time, the first image retrieval is a first distance 41a detected between the first side point 311a and the reference point 221. The document 30 is further fed in for an appropriate length 32a. The side 31 will intercross with the scan line 17 to form a second side point 312a. At this time, the second image retrieval is a second distance 42a detected between the second side point 312a and the reference point 42a.

[0050] A value of difference will be calculated by comparing the difference value of the first distance 41 and the second distance 42 in Fig. 5A and Fig. 5B with the difference value of the first distance 41a and the second distance 42a in Fig. 6A and Fig. 6B.

[0051] Wherein, Fig. 7A and Fig. 7B is the detecting method that the arrangement of the colored pattern layer 22 is at the right position of the scan line 17. The document 30 has at least a side 31b. The side 31b is parallel to the feeding direction 222, of which the document 30 is fed into the automatic document feeder 2. When the document 30 is automatically fed in initially, and the document 30 is slanted to the second direction (i.e., the counter clock-wise direction) 44, the side 31b will move onto the scan line 17 firstly, and intercross with the scan line 17 to form a first side point 311b. At this time, the first image retrieval is a first distance 41b detected between the fist side point 311b and the reference point 221a. The document 30 is further fed in for an appropriate length 32b. The side 31b will intercross with the scan line 17 to form a second side point 312b. At this time, the second image retrieval is a second distance 42b detected

between the second side point 312b and the reference point 221a.

[0052] Of course, when the document 30 is slanted to the first direction (i.e., clock-wise direction) 43, an identical method of detection is also applied. When a colored pattern layer 22 is provided respectively at the left and right positions of the scan line 17 and the arrangement of the colored pattern layer 22 is a stripe that covers the entire scan line 17 or an arrangement of circular shape or other shapes, a function of the present invention may also be executed easily. So, according to the aforementioned description of the present invention, these sorts of transformation may executed easily, and still are within the technical scope of the present invention, therefore a detailed description is not repetitiously presented here.

[0053] From the illustrations from Fig. 5A through Fig. 7B, a slant value of the document 30 is further calculated out from the first image retrieval and the second image retrieval. The slant value is a ratio of the difference value between the first distance 41 and the second distance 42 versus the appropriate feeding length 32 (i.e., slant value = (the first distance 41 – the second distance 42) / feeding length 32). Since the calculated ratio is a radius degree of sine angle, so the slant angle may be calculated from this equation.

[0054] Please refer to Fig. 8 and Fig. 9, which are the flow chart illustrations for the preferable embodiments for the method of the present invention to test slant for an optical scanner provided with automatic document feeder. Wherein, a slant-testing method for optical scanner with automatic document feeder of the present invention, comprising following steps:

[0055] Step A: providing an optical scanner having an automatic document feeder and a document 50. The automatic document feeder has a colored pattern layer that has a color different from that of the document in corresponding to a scanning window of the optical scanner. The document has at least one side edge that is parallel to the feeding direction of the document fed into the automatic document feeder. When the document is fed into the automatic document feeder, the side edge is just located between the scanning window and the colored pattern layer.

[0056] Step B: Actuating the automatic document feeder to feed in the document 51, a first image retrieval 511 is made for the document placed on the scanning window. Wherein, the first image retrieval is a first distance detected between the side placed on the scan line of the scanning window and a reference point positioned at the colored pattern layer. While the reference point is a fixing point of the colored pattern layer located at the most inner or outer side of the scan line, of course, the reference point may also be other fixing point provided for convenient detection.

[0057] Step C: An appropriate length 52 of the document is fed in. The appropriate length is a fixing length through calculating such that sufficiently provides judgment for the slant angle.

[0058] Step D: A second image retrieval is made for the document placed on the scanning window. Wherein, the second image retrieval is a second distance detected between the side of the scan line and the reference point after the appropriate length is fed.

[0059] Step E: A slant value 53 is calculated out from the result of comparing the first image retrieval and the second image retrieval. The slant value 53 is a ratio calculated by an electronic calculation device from the difference value between the first distance and the second distance versus the appropriate length. Since the calculated ratio is a radius degree of sine angle, so the slant angle may be calculated out. The electronic calculation device is a calculator or calculation software program in the computer executing scanning.

[0060] In a preferable embodiment of the present invention, following steps are further included after the step E.

[0061] Step F: Comparing the slant value with a preset value 54 that has been tested for providing the document fed appropriately into the scanning area. If the slant value is smaller than the preset value 55, then scanning the document is begun 57; if the slant value is larger than the preset value 56, then the motion is stopped 58.

[0062] In summary, when the comparing result is that the slant value is larger than the preset value, it can facilitate the automatic document feeder to set off an alarm for notifying the operation personnel. Or, when the

comparing result is that the slant value is larger than the preset value 56, the automatic document feeder is designed to release the document automatically or take out the document manually 59. Afterwards, the document is placed in from beginning and the continuous steps of detection after the Step B are executed in the same manner.